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ELECTRICAL MOTORED EQUIPMENT: APPROVALS AND EXTENSIONS

BY

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ELECTRICAL MOTORED EQUIPMENT: APPROVALS AND EXTENSIONS[1]

By L. C. Ilsley[2] and M. W. Means[3]

The electrical section of the United States Bureau of Mines, at the Pittsburgh Experiment Station, has carried on investigations pertaining to the safety of electrically operated mine equipment over a period of nearly 20 years. Under the guidance of schedules, equipment is inspected and subjected to certain tests to prove its suitability for use in mine atmospheres which may become dangerous from an accumulation of inflammable gas or coal-dust. As a result of these investigations more than 30 companies have had equipment approved so that bureau-approved electrical mine equipment is now available covering practically every operation common to underground operations.

The bureau's official approval of a device applies to a definite fixed design and is identified by a specific set of drawings covering the outfit. These drawings are kept on file at the bureau's Pittsburgh Experiment Station. If machines were never changed from the design originally approved, the bureau's work would be much less complicated. Change, however, is the order of the present age; and permissible equipment is no exception. In fact, the development and improvement in electrical mine equipment has been so rapid that the bureau is flooded with requests for approval of modified designs of equipment previously approved. These changes are handled as "extensions" to the approvals already granted and cover a wide field. In some, only minor details are under consideration; in others, major changes in the construction of the apparatus as a whole are involved. The bureau must consider all modifications, irrespective of their magnitude, in order to be assured that no important detail involving the safety of the equipment as a whole is overlooked. The procedure that should be followed in having modifications formally approved often puzzles the manufacturer, and it is chiefly for the purpose of clarifying the matter that this paper has been prepared.

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1 - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6218."

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Detailed Procedure Covering Extensions

Extensions of approvals covering modifications in design may include the addition of new parts, the elimination of old parts, or the changes of parts already in use. The bureau handles requests for extensions somewhat differently, depending upon the extent and nature of the modification. Three general classes of extensions are considered under the following subdivisions: (1) Formal extensions involving tests; (2) formal extensions which do not involve tests; and (3) informal extensions. The general procedure for handling each type of modification will be outlined in the order just listed:

1. Formal Extensions Involving Tests

Formal extensions which involve tests are common and usually involve one or more of the following changes in design:

a. Change in the volume of the unoccupied space within a compartment.

b. A rearrangement of parts within an explosion-proof compartment that may change pressure values resulting from a gas explosion within the compartment.

c. A change in the material of the main shells (casing walls) of compartments or covers for them which may weaken the compartment.

d. Any modification of openings into explosion-proof compartments, including change in lead entrance, change in bearings, change in flange surfaces, and changes in the bolt spacing which fasten compartments or covers for them.

e. The additon of openings or the change in the size of openings between explosion-proof compartments.

f. Changes involving the adequacy of switches, fuses, circuit-breakers, contactors, relays, and other current-interrupting devices.

g. The addition of new explosion-proof compartments.

The procedure that should be followed in requesting an extension of approval involving tests is as follows:

(1) First an application for the extension should be made to the Director of the U. S. Bureau of Mines, Washington, D. C. This application should be accompanied by a check made payable to the Treasurer of the United States for an amount necessary to cover the expense of the tests. The cost per compartment is stated in the schedule of fees.

(2) A copy of the application letter should be sent to the Supervising Engineer, Electrical Section of the Pittsburgh Experiment Station, 4800 Forbes St., Pittsburgh, Pa.

(3) Drawings showing the extent and nature of the change should be attached to the supervising engineer's copy of the application. Drawings should not be sent to the director.

(4) Apparatus for test should be shipped prepaid to the Pittsburgh Experiment Station, marked for attention of the Supervising Engineer, Electrical Section.

(5) Apparatus that has met the inspection and test requirements is returned to the manufacturer at his expense.

(6) If apparatus does not meet the inspection and test requirements, the bureau so advises the manufacturer and awaits advice as to its disposal.

(7) The manufacturer should not expect or request the engineers in charge of testing to give out official information in regard to the permissibility of parts. Such information is furnished the manufacturer through the Washington Office of the bureau.

2. Formal Extensions Not Involving Tests

Extensions of approvals covering modifications which do not involve changes such as are listed under the previous heading but which are of sufficient extent to require a considerable change in the drawing lists, or involve an important rearrangement of electrical parts relative to each other or to the mechanical layout of the equipment, are considered formal extensions and are handled through the Washington Office of the bureau.

The same procedure should be followed by the manufacturer in making application for an extension except that no fee need be submitted, and in general the equipment is not required for inspection. If the equipment is required for inspection, the same procedure is followed as for equipment being submitted for tests.

3. Informal Extensions

There are a large number of simple changes concerning which the bureau wishes to be advised but which are deemed so immaterial that they do not require formal consideration. The supervising engineer has been authorized by the director of the bureau to handle such changes direct from the Pittsburgh Experiment Station. Such changes are handled by the use of form sheets with a return post card which advises the bureau that the change has been recorded by the manufacturer. Changes not included in the first two groups can usually be handled by this simple short method which speeds up the extension work at both ends.

Application for such extensions can be addressed to the Supervising Engineer, Electrical Section, Pittsburgh Experiment Station, 4800 Forbes St., Pittsburgh, Pa. A drawing or drawings showing the extent and nature of the application should accompany the letter of application. Apparatus is not required for informal extensions.

Bureau of Mines Procedure

The procedure followed by the bureau in handling extensions is briefly summed up as follows:

a. The drawings received from the company specifying the change are compared with those on file.

b. If the change affects any of the essential features involved in the original tests, such as unoccupied space of compartments, flange surfaces, flame paths through bearings or lead entrances, or materials of which the compartment walls, covers, etc., are made, the company will usually be asked to submit the compartment for retest.

c. The modified compartment, after receipt by the bureau, is disassembled and checked against the drawings submitted to determine if the compartment agrees with the drawings and ascertain if it meets the inspection requirements of the schedule.

d. If the compartment meets the inspection requirements, it is tested in explosive mixtures of natural gas and air.

e. After the compartment has passed the inspection and test requirements of the schedule, the bureau's records at the Pittsburgh Experiment Station are completed and recommendations for granting the request for extension of approval are forwarded to the Washington Office. The manufacturer is also furnished a brief report covering the essential findings of the inspection and test.

f. If it is judged from the examination of the drawings that a retest is not necessary and that the modified construction meets the schedule requirements, recommendations for granting the request for extension of approval are forwarded to the Washington Office.

g. If it is judged from an examination of the drawings that the changes are minor in character and have no direct bearing on the permissible features of the machine, or involve no important rearrangement of parts, a special form authorized by the director of the bureau for the Pittsburgh Station is used in granting the extension.

Growth of Approval Work

The following tabulation covering 16 years of approval activities gives an indication of the growing interest in this class of safety work, and perhaps will be interesting to some in showing the scope of the work at the present time:

Statistics Covering Approved Motor-Driven Equipment

Year	Approvals issued	Extensions granted	Manufacturers holding approvals
1914	1	0	1
1915	0	1	1
1916	1	1	2
1917	2	0	3
1918	0	0	3
1919	1	0	3
1920	1	5	3
1921	1	1	4
1922	7	22	7
1923	2	61	8
1924	5	99	8
1925	13	253	11
1926	16	223	15
1927	17	131	20
1928	17	463	25
1929	19	760	31